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GB 2266652 A GB 1356002 A WO 95/21539 A1

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(54) Feed for poultry

(57) This invention concerns an animal feed comprising cereal, a protein source, fresh fish oil, treated at extraction with antioxidant and Vitamin E. The feed is for use in increasing concentration of omega-3 polyunsaturated fatty acids in an animal carcass.

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TITLE: Animal feed.

DESCRIPTION

This invention concerns animal, especially poultry feed.

For some years there has been a considerable interest in the beneficial effects on health of the omega-3 polyunsaturated fatty acids:- linolenic acid (18:3), eicosapentaenoic acid (20:5 "EPA") and docosahexaenoic acid (22:6 "DHA") and clinical and epidemiological data suggest that intakes of these polyunsaturated fatty acids may reduce the incidence of coronary artery disease as well as decreasing the blood viscosity and the stickiness of its platelets. These polyunsaturated fatty acids cannot be made by the body and hence have been called the Essential Fatty Acids. They are important in body function in that they are the source of the body's 20 carbon atom carboxylic acids known as the prostaglandins which are derived insitu from these polyunsaturated fatty acids by biosynthesis. From a commercial point of view suitable dietary omega-3 polyunsaturated fatty acids are limited to fish body and fish liver oils and to seed oils like linseed and rapeseed but up to the present these have had to be refined and deodourised and are therefore relatively high cost materials. The refined fish oils are

expensive and linseed oil is not normally part of the human diet. Furthermore, the general population do not eat sufficient fish. Therefore, there is a need for a process which is capable of providing a new food source of EPA and DHA.

An object of this invention is to provide a diet and feed regimen which is capable of rearing poultry to provide higher amounts of omega-3 polyunsaturated fatty acids than is normal for this type of meat.

According to a first aspect of the invention there is provided an animal feed comprising cereal, a protein source, fresh fish oil, treated at extraction with antioxidant, and Vitamin E.

According to a second aspect of the invention there is provided a method of increasing concentration of omega-3 polyunsaturated fatty acids in a food source carcase comprising subjecting a live animal to a feed regimen including an animal feed comprising cereal, a protein source, fresh fish oil, treated at extraction with antioxidant, and Vitamin E.

The cereal for the animal feed of the invention may be selected from wheat, barley, maize and sorghun and the protein source may be selected from soya meal, rapeseed oil absorbed and compressed into bean meal, lysine, sunflower and methionine. The animal feed of the invention preferably further comprises one or more

minerals and preferably further comprises one or more Vitamins in addition to Vitamin E. One or more additional fats may also be included in the animal feed of the invention.

The invention is particularly suitable for poultry for may also be used in other non-ruminant food source animals, such as, for example, pigs.

Thus, the invention provides a method of increasing the concentration of EPA and DHA in the carcasses of, for example, broilers by subjecting the poultry to a feed regimen where the conventional commercially available diet is modified by the inclusion of fresh fish oil, which has been treated at the time of extraction with a mixture of preferably two or more antioxidants, into the starter and finisher diets of the poultry, but preferably to the finisher diets only, and preferably by providing a sufficient level of Vitamin E, typically 2 to 5 times the amount conventionally added to poultry feed, in the overall feed so as to inhibit post-slaughter development of fat oxidation which can lead to taste and odour problems in the cooked and stored meat. Although EPA and DHA can be biosynthesised from dietry supply of oils rich in linolenic acid, the conversion rate is slow and the amounts of these important acids which are formed can be small, so it is important, both from the animal diet and human food (end

product poultry meat) points of view, that the diet contains an oil which is high in EPA and DHA content and the poultry meat produced from it be high, when compared to conventionally fed poultry meat, in the same essential fatty acids. Accordingly, when the diet and feed regimen of this invention is put into practice in the experimental production of chickens it has been frequently found that the carcass contains up to 10 times more EPA and DHA than standard chicken meat.

This invention will now be further described with reference to the following Examples. "High Omega" chickens fed according to this invention were found to test out at 180 to 200mgs/100 grams of meat as the sum of the EPA and DHA whereas the values for ordinary fed chicken meat were in the range 20 to 30 mgs/100 grams of meat. The diets used in the experimental evolvement of this invention were produced by the pellet extrusion method which is in widespread use in the feeding stuffs industry and the compositions to which the special omega-3 oils were added were thus:-

Values in grams per 100 grams

	Omega-3 Diets		Control Diets	
	Example 1	Example 2	Example 3	Example 4
INGREDIENT	Starter	Finisher	Starter	Finisher
Wheat	56.89	67.56	58.00	70.00

Soya Meal	23.77	12.82	23.16	12.95
Extrupro (T.M.)*	10.00	10.00	10.00	10.00
Lysine	0.15	0.05	0.15	0.05
Sunflower	3.00	3.69	3.00	1.88
Methionine	0.23	0.08	0.18	0.04
Limestone Flour	1.37	1.22	1.15	0.92
Dicalcium Phosphate	1.35	1.26	1.48	1.39
Sodium Chloride	0.08	0.11	0.08	0.11
Soya Oil	----	----	1.50	0.37
Mill Fat Blend	0.50	1.16	----	----
Palm/Soya Fat Blend (80:20)	----	----	0.50	1.50
Sodium Bicarbonate	0.37	0.31	0.35	0.35
Broiler Starter Supplement	0.80	----	0.45	----
Broiler Finisher Supplement	----	0.80	----	0.45
Spiked Fish Oil Fraction	1.79	1.25	----	----
Normal Vit. E Addition (gm/Ton)	50	50	50	50
Extra Vit. E added (gm/ton)	150	150	----	----

* Extrupro (T.M.) is a proprietary product used by feeding stuff manufacturers and is reported to be

manufactured by milling whole rape seed with pulses like beans and then extruding the product.

By this method the rape oil which would normally be extruded under pressure is absorbed into the bean meal and the resulting product is dry. The presence of rapeseed oil, already freshly absorbed and compressed into the bean meal as Extrupro (T.M.), gives the poultry diet an added amount of omega-3 polyunsaturated fatty acid in the form of linolenic acid (18:3) and because its bioconversion to EPA and DHA is normally slow it means that the final poultry meat shows an increase in linolenic acid in addition to the already described increase in EPA and DHA content when compared to standard fed poultry flesh. The omega-3 polyunsaturated fatty acid content of broiler meat from the fish oil supplement diet, which finished at 1.25 grams oil/100 grams of meal, had a determined fatty acids profile, expressed as mgs/100 gms flesh, or:-

FATTY ACIDS (F.A.'S)	(18:3)	(20:5)	(22:6)	Total Omega-3 F.A.'s
Supplement Feed	225.4	118.5	131.9	475.8
Control Feed	190.1	9.5	12.5	212.1

These experimental results represent a 220% increase in the total omega-3 fatty acids content, but more important, an 1100% increase in the combined

eicosapentaenoic (20:5) and docosahexaenoic (22:6) acids content. On this basis the new "High Omega-3" meat is a better source, weight for weight, of EPA + DHA than some fresh fish fillets. The fish body oil fraction used in this described invention is produced in as fresh a state as possible from any blend of species, even as a mixed catch, and as soon as the oil is isolated at the factory it is immediately oxidation inhibited by the use of either butylated hydroxyanisole (BHA) or butylated hydroxytoluene (BHT) in conjunction with an alkyl gallate all of which are available as food additives under Euro Numbers 320, 321, 310 and 311. These fatty food preservatives have the specific effect of protecting the polyunsaturated glycerides and fat soluble vitamins of the fish body oil from destructive and rancidity effects of aerial oxidation and in doing so limit peroxide formation. In this respect it should be noted that BHA or BHT in conjunction with an alkyl gallate, where the two are synergistic, can only act to prevent autoxidation of the fatty acid components in the fish oil which are characterised by having congugate double bonds. This is a chemical rather than a biochemical effect and unlike these inhibitors the normal Vitamin E content, and that added in compliance with the innovation described herein, are there to act during the metabolism of the feed as tissue anti-

oxidants which tend to preserve the integrity of the lipid omega-3 fatty acids in the body. The main reason for the transient effect of these chemical, rather than biochemical, antioxidants is the fact that up to 77% of their initial concentration is lost by excretion in the urine within 24 hours of ingestion. In all these described experimental feed trials the fish body oils, before the addition of BHA or BHT with the alkyl gallate, had the following preferred specification:

Free Fatty Acids - maximum of	5% by weight
Moisture & Solids - maximum of	1% by weight
Iodine Value mg/100g	135
Peroxide Value M.Ec/Kg maximum of	10
Totox Value - maximum of	25

Omega-3 Fatty Acids - minimum of 17.5% by weight.

Since the Control and Omega-3 feeds contain Vitamin E it is desirable to protect both from the oxidative effects of atmospheric air permeability in the extruded feed pellets and this was achieved in practice by spraying the pellets, whilst in tumble motion from the extruder, with a 1% to 5%w/w of a fat blend with a congealing point above ambient temperature so that it plugs surface capillary endings in the pellet's surface thus decreasing the permeability of atmospheric oxygen. In this respect it is found to be further beneficial to spike this sprayed fat with an effective amount of BHA

or BHT with an alkyl gallate. It will be appreciated by those skilled in the art that this innovative feed regimen, which has been described basically for the rearing of "High Omega-3" chickens is equally applicable as a diet for any meat-bearing non-ruminant. It is interesting to further note that the poultry flesh produced by the application of this described feed regimen produces a carcass which has:

Stability on fresh storage to 8 days at $3^{o}C$.

Stability on freezing.

Stability to normal cooking temperatures.

and which when cooked and served, or when cooked and served after 7 days chilled storage, has no detectable fishy taste or odour when passed through a panel of 32 persons who were skilled and experienced in these organoleptic procedures.

CLAIMS

1. An animal feed comprising cereal, a protein source, fresh fish oil, treated at extraction with antioxidant, and Vitamin E.

2. An animal feed as claimed in claim 1, wherein the cereal is selected from wheat, barley, maize and sorghum.

3. An animal feed as claimed in claims 1 or 2, wherein the protein source is selected from soya meal, rapeseed oil absorbed and compressed into bean meal, lysine, sunflower and methionine.

4. An animal feed as claimed in claim 1, 2 or 3 further comprising one or more minerals.

5. An animal feed as claimed in any one of claims 1 to 4 further comprising one or more Vitamins in addition to Vitamin E.

6. An animal feed as claimed in any one of claims 1 to 5, further comprising one or more additional fats.

7. An animal feed as claimed in any one of claims 1 to 6, wherein the fish oil has a maximum of 5% by weight of free fatty acids.

8. An animal feed as claimed in any one of claims 1 to 7, wherein the fish oil has a maximum of 1% by weight of moisture and solids.

9. An animal feed as claimed in any one of claims 1 to 8, wherein the fish oil has an iodine value of about 135 mg/100g.

10. An animal feed as claimed in any one of claims 1 to 9, wherein the fish oil has a maximum Totox value of 25.

11. An animal feed as claimed in any one of claims 1 to 10, wherein the fish oil contains at least 17.5% by weight of omega-3 fatty acids.

12. An animal feed as claimed in any one of claims 1 to 11, wherein the fish oil is treated with two or more antioxidants.

13. An animal feed as claimed in any one of claims 1 to 12, wherein the antioxidants are selected from butylated hydroxyanisole, butylated hydroxytoluene and alkyl gallates.

14. An animal feed as claimed in any one of claims 1 to 13, wherein the amount of Vitamin E included is sufficient to inhibit post-slaughter development of fat oxidation.

15. An animal feed as claimed in claim 14, wherein the amount of Vitamin E included is 2 to 5 times the amount conventionally added to animal feed.

16. An animal feed as claimed in any one of claims 1 to 15 in the form of pellets.

17. An animal feed as claimed in any one of claims 1

to 16 adapted for poultry.

18. A method of increasing concentration of omega-3 polyunsaturated fatty acids in a non-ruminant animal carcase comprising subjecting the live animal to a feed regimen including an animal feed as claimed in any one of claims 1 to 16.

19. A method as claimed in claim 18, wherein the animal is poultry.

20. A method as claimed in claim 19, wherein the poultry is chicken.

21. A poultry feed substantially as hereinbefore described with reference to Example 1 and Example 2.

22. A method of increasing concentration of omega-3 unsaturated fatty acids in a poultry carcase substantially as hereinbefore described with reference to Example 1 or Example 2.

The Patent Office

13

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Claims searched: 1-22

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Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): A2B(BMA9)

Int Cl (Ed.6): A23K 1/10; 1/18

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB2266652A	(WOOBANG) see Example 1	1&18
A	GB1356002	(KROYER) see Example 2	1&18
A	WO95/21539A1	(FARRELL) see page 6 lines 1-2	1&18

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.